PIETENPOL

AIR CAMPER

In 1932, the Flying and Glider Manual presented the construction article on the full size homebuilt of the "Air-Camper." It was powered by a Ford Model 'A' engine. This 1/4 Scale replica is a winner with an O.S. .60 four-stroke.

By Gene Wallock

I have admired the Pietenpol Air-Camper for years because of its exquisite simplicity and subtle charm. Several years ago I had the opportunity to copy the original "Flying and Glider Manuals" published by Fawcett Publications in the late twenties and early thirties. The 1932 edition had the construction article for the full size aircraft, including the "Model A" engine conversion. A few years ago I joined the Experimental Aircraft Association (EAA) and to my pleasant surprise, they offered reprints of the original manuals. I ordered the set, saw the Pietenpol article again and decided I had to model it.

The O.S. .60 4-cycle engine came on the market and Quarter Scale modeling was in full bloom. A quick check of dimensions resulted in an 84½" wingspan model. The manual text revealed the Clark Y airfoil was tried on early versions and the Clark Y is an old standby in modeling, so the model designed started to click. Tail area is especially vulnerable to scale modeler's "let's make it bigger" attacks. I figured that at Quarter Scale no enlargement was necessary. (I feel the same way about Peanut Scale.) Let's face it, an airplane is completely scaled down or it isn't scale. It's Stand-Off, butcher or fish, but scale it ain't.

The construction style was the next consideration. I **liken** solid sheet construction building apple crates and foam is something that makes shaving easier and girls more proportional. After five minutes consideration, I decided to draw it using scale construction. Fortunately, wood sizes in the 1930's were nice and comfortable, like 1" square or the ever popular 1" by 3/4". Dividing numbers like this by four may be done in your head, unless you've been educated with new math. In that case, buy a calculator and get familiar with the number 4 and the ÷ button.

ABOUT THE AUTHOR

Gene Wallock began modeling in 1939. His mom cut the parts out as razor blades are dangerous for a 5 year old. His free-flight contest flying started in 1948 and lasted through 1958. Old-timer FF was his main activity through 1978.

He owns P & W Model Service and produces kits for several well-known companies. He holds a degree in Aeronautical Engineering from Cal Poly, San Luis Obispo (1957). Gene worked in Aerospace until 1977 when he decided to devote his full time to P & W. He collects pre-WWII ignition engines, kits, and magazines. His modeling involvement is reflected in his membership numbers: AMA 598, SAM 22 and MECA 178.

Gene has an outgoing personality and delights in sharing his expertise with anyone requesting assistance. Those of us acquainted with Gene Wallock have learned that he is also afflicted with a subtle and slightly sardonic sense of humor. Don't tell him, but we think he's a pretty neat guy.

After the plans were drawn, I took a few modeling liberties:

(1) Solid ribs were used instead of built-up. I did this because someone else may want to built it and they might not share my passion for building.

(2) The scale landing gear requires an expert tin bender for the fittings and that technique I leave to the master — Lou Proctor.

(3) My '71 Chevy Kingswood wagon would transport the model assembled very nicely; but my good friend, John Camp's Porsche 924 wouldn't. John wanted to build one with me, so his car became the transport envelope. Thus, the three piece wing came to be.

(4) Cabanes that aren't readily removable create building problems because they usually end up in your eye, nostril, or some other part of your anatomy while you're putting a sanding move on the model. A broken cabane in a finished model will cause grown men to weep at the repair prospects. Relax, they're removable.

(5) A steerable tail wheel was used in lieu of a re-bent "Model T" 4th leaf spring. It makes ground handling easier and was used on some full size "Pete's".

(6) Wire rigging was eliminated as a structural requirement. Obviously, it can be added for maximum scale points.

Scale Reference:

The "EAA 1932 Flying and Glider Manual" is my primary source. However, in 1981, there were 54 Air-Campers registered in flying condition, so a little sleuthing and you'll probably find a full size example at a local flying field (would you believe somewhere in your state?). I have old magazines that show them with cub type wheels, motorcycle wheels, Lycoming engines, radiators mounted in the cowl chin and Mr. Pietenpol's latest example had a Corvair engine in it. If you want to build it for sport flying, build and finish it to your own idea of what your full size one would look like. Remember, it is a homebuilt.

Construction Considerations:

Before starting construction, the following must be established:

(1) **Engine:** The O.S. .60 4-cycle is ideal for scale sound. The K & B .61 provides a bit more power on the same prop and fuel (a 16/6 Y & O and K & B 100 fuel). You say a 16/6 won't work on a K & B .61 — **wrong!** Run the engine slightly rich to prevent overheating and enjoy. Actually, any cross scavanged (Non-Schnuerle) .60 will be fine or a 4-cycle up to .90 c.i. I do have a Quadra in my Sears chain saw and it cuts wood, not air. The model is not designed or stressed for the industrial type engine. The model should

This 1932 flying and glider manual has the complete building plans and instructions for the full size Air Camper available from EAA, Hales Corners, Wisconsin 53130 for a price of $2.50.

PIETENPOL AIR CAMPER

Designed By: Gene Wallock

TYPE AIRCRAFT
1/4 Scale Homebuilt

WINGSPAN
84½ Inches

WING CHORD
15 Inches

TOTAL WING AREA
1267 Sq. In.

WING LOCATION
Parasol

AIRFOIL
Clark Y

WING PLANFORM
Constant Chord

DIHEDRAL EACH TIP
1/4 Inch

O.A. FUSELAGE LENGTH
51⅝ Inches

RADIO COMPARTMENT SIZE
(L)13" x (W)5½" x (H)5½"

STABILIZER SPAN
22½ Inches

STABILIZER CHORD (incl. elev.)
9⅛"

STABILIZER AREA
184 Sq. In.

STAB AIRFOIL SECTION
Flat

STABILIZER LOCATION
Top of Fuselage

VERTICAL FIN HEIGHT
7¾ Inches

VERTICAL FIN WIDTH (incl. rudder)
8½" (Avg.)

REC. ENGINE SIZE
.60 4-cycle

FUEL TANK SIZE
8 Oz.

LANDING GEAR
Conventional

REC. NO. OF CHANNELS
4

CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Pine, Spruce, Ply
Wing	Balsa, Spruce & Ply
Empennage	Balsa & Ply
Wt. Ready To Fly	**168 Oz.**
Wing Loading	**19 Oz./Sq. Ft.**

weigh a little over ten pounds ready to fly. That's the whole airplane, not just the engine. With the 20 ounce O.S. .60 4-cycle, the model will balance with minimum nose weight.

(2) **Gas Tank:** The original model uses an 8 oz. Kraft Slimline tank which is good for 15-20 minute flights. The tank's physical size is needed to establish the dimensions of the tank "doghouse." Most models have internal tanks with plumbing running through firewalls. Neat, till they leak or the line deteriorates. The "Pete" has an oil wall with an opening (door of the doghouse). The tank slides in through the oil wall and is held in place by foam tape on the sides and rear (vibration isolation) and the engine mounting plate in the front. If the tank fails, remove the engine plate, pull the old tank out, shove a new one in and hook up lines directly to the engine. The doghouse uses a light ply floor and back, and 1/64" ply cover. Naturally, the inside has several coats of K & B resin.

(3) **Aileron Servo:** The aileron servo output (wheel or arms) driver will determine the location of the aileron bellcrank control rod holes in the ribs. The original model used a Kraft KP-15 III servo and Sullivan Gold'N-Rods. Contrary to popular opinion, temperature stability was no problem with the rods.

CONSTRUCTION

The "Pete" is built in the following sequence to insure proper alignment and minimum wood waste:

(1) Fuselage sides, cabanes and 1/8" ply wing center ribs.

(2) Fuselage frame and landing gear.

(3) Wing and struts.

(4) Tail group.

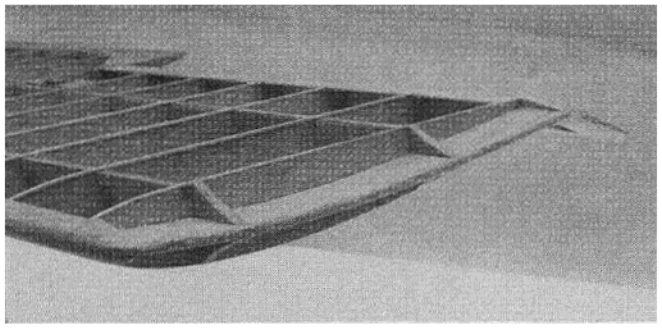
(5) Fuselage completion.

(6) Assembly and covering.

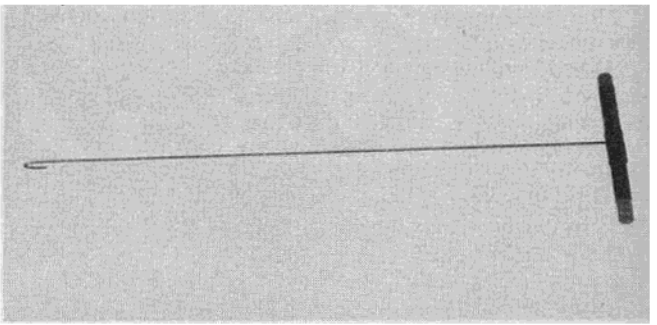
Fuselage Sides, Cabanes & Center Ribs:

I assume any modeler building the "Pete" doesn't need "glue stick A to stick B instructions," so I'll describe my building technique.

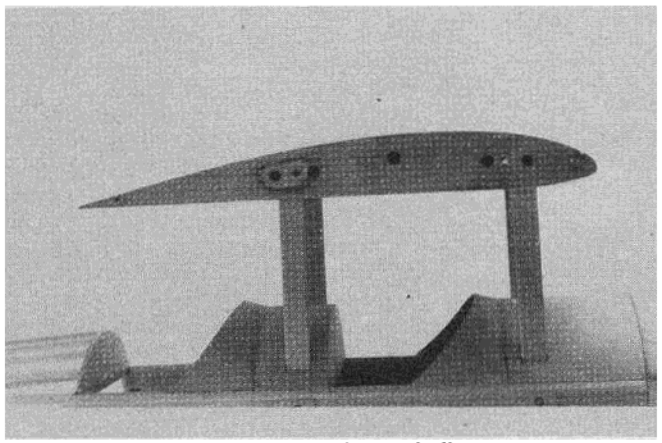
I build both sides at the same time to insure identical sides. I use the outside outlines and the front edge of uprights and diagonals as reference to eliminate wood size tolerance



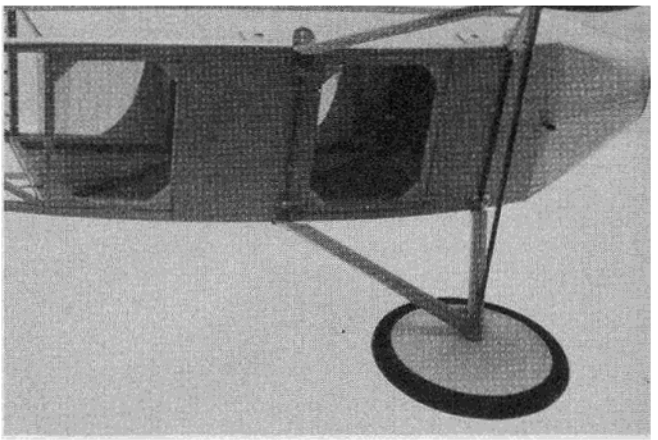
Contoured wing tip and braces.



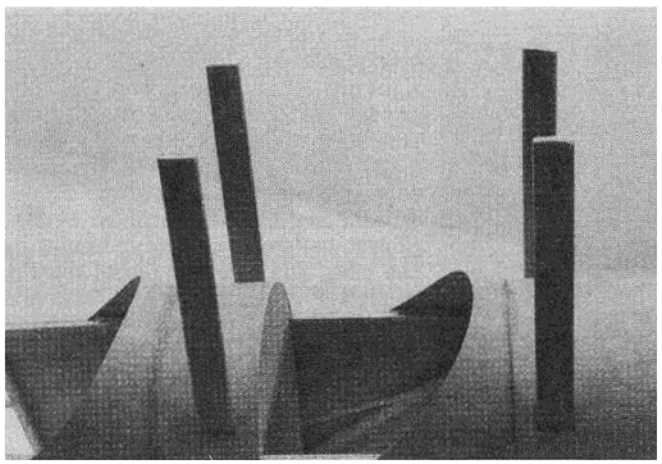
Wing band puller hook.



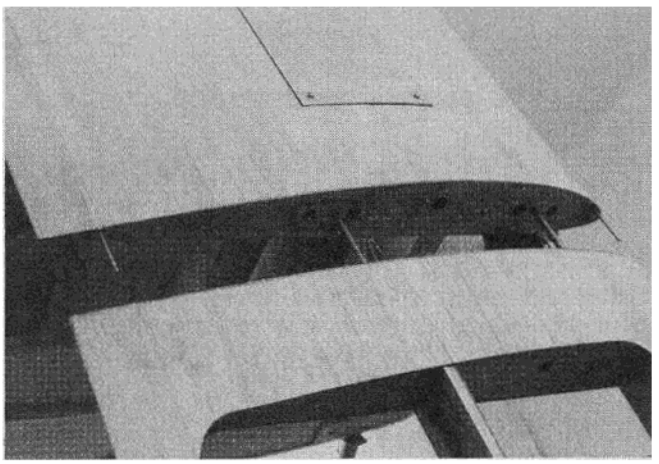
Center section trial fit — note cabane aft tilt.



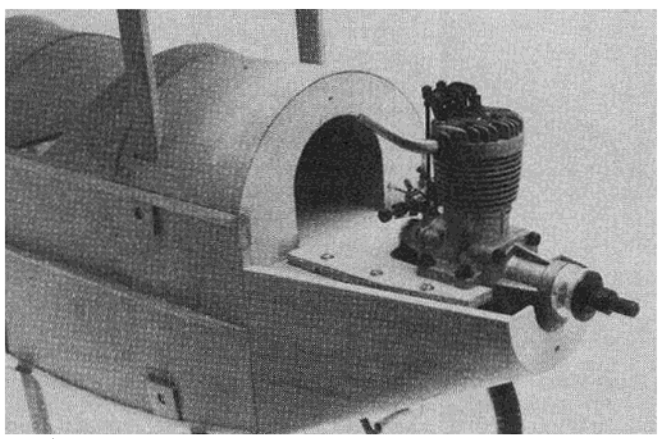
Inset radio compartment hatches and gear mounting.



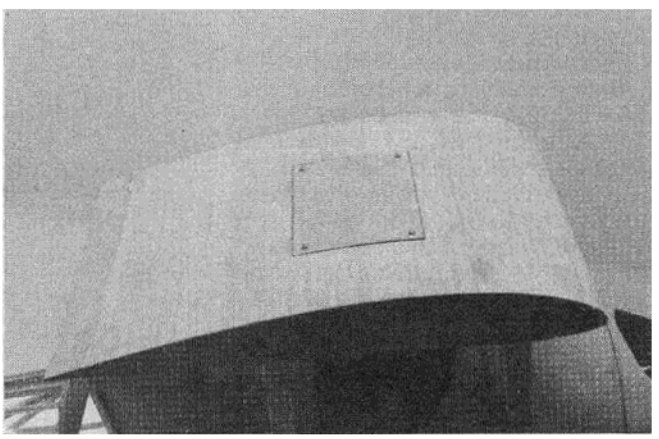
Cabane installation — Note screws in top of cabane struts for assembly orientation.



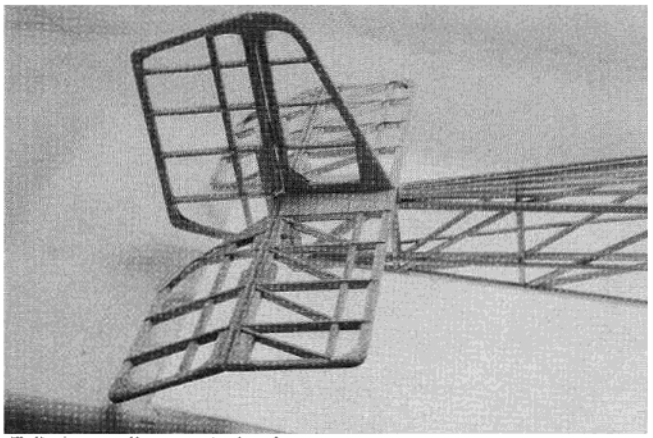
Trial fit of outboard panel to center section.



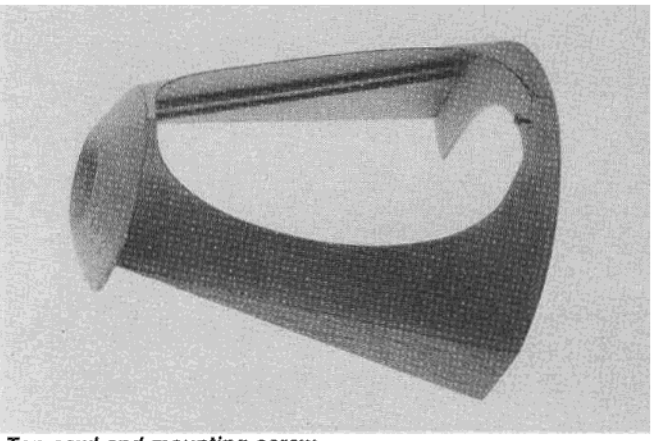
O.S. .60 four cycle installation on engine plate and tank "dog house."



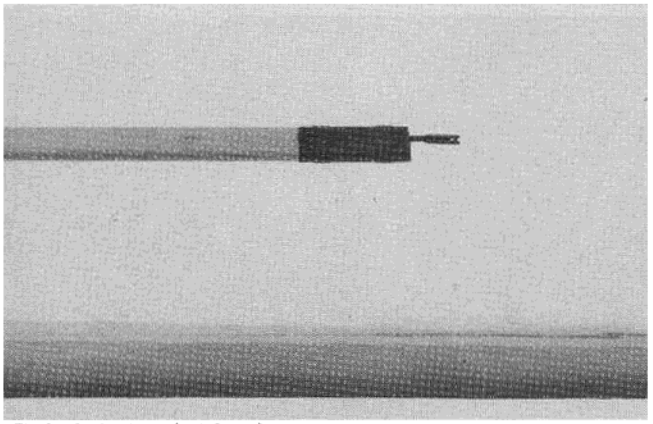
Aileron servo hatch cover on wing center section.



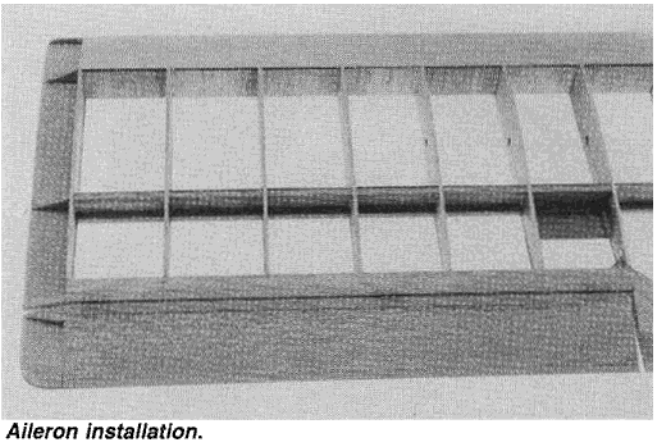
Tail group alignment check.



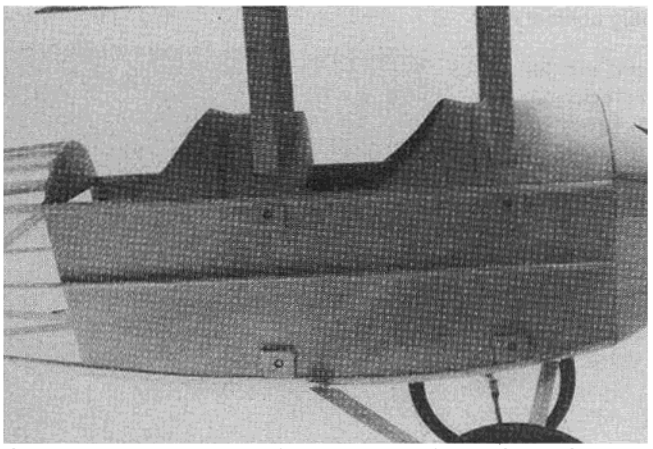
Top cowl and mounting screw.



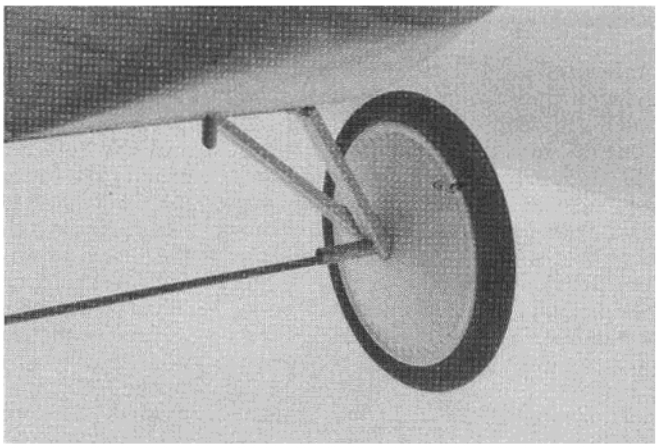
Typical strut end at fuselage.



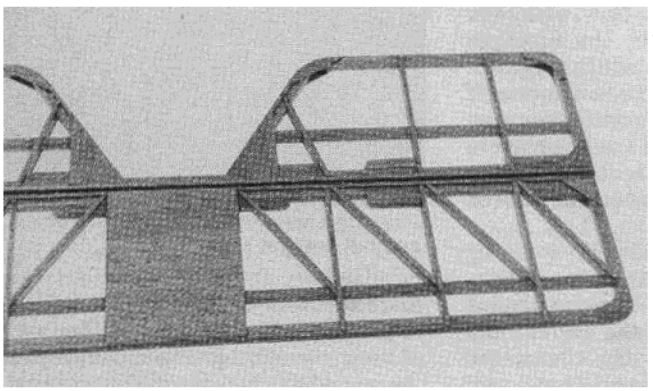
Aileron installation.



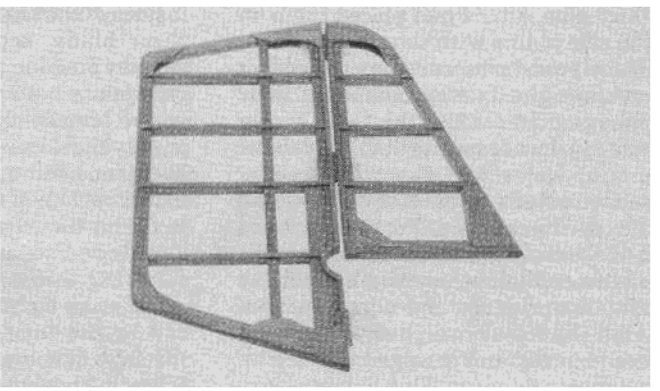
Cabane mounting screw fairing plates and covering strips.



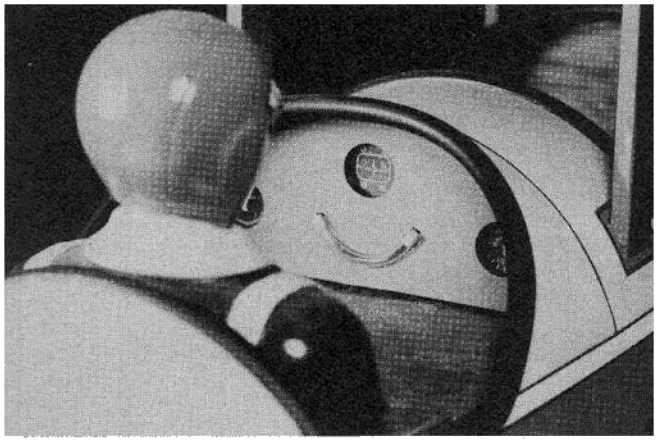
Optional balsa strut fairings and completed L.G. assy.



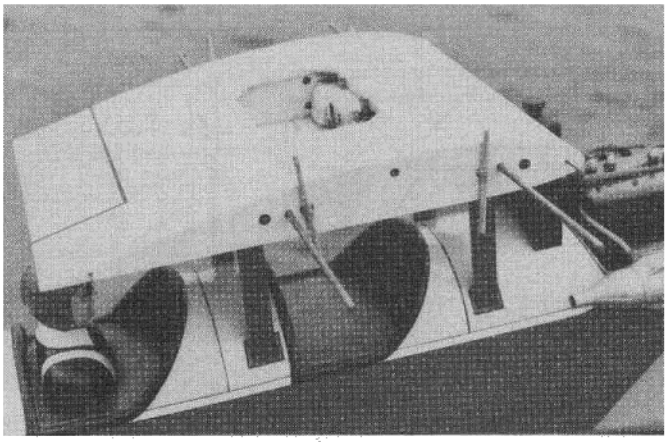
Stab/elev. assembly.



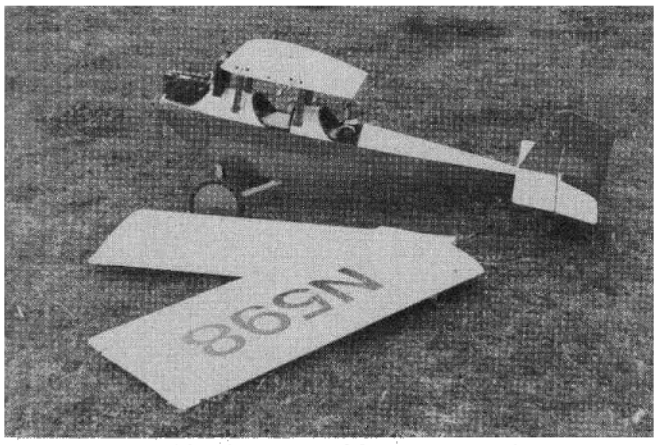
Fin/rudder assembly.



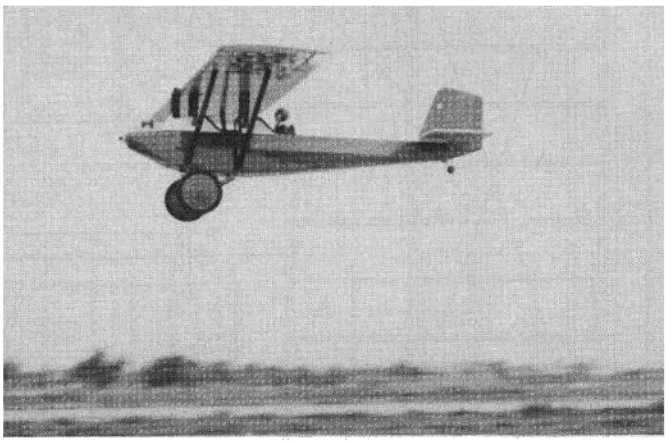
Looking into the rear cockpit — note the simplicity of instruments.



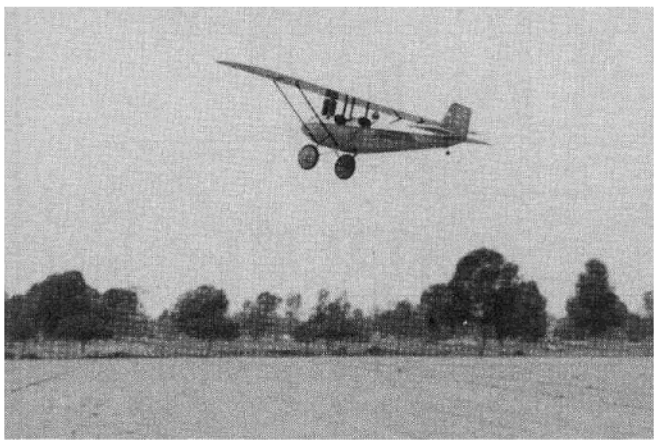
Rubberband installation prior to outbord panel mounting.



Ready for assembly after removal from a compact car.



Slow fly-by on gorgeous day. Someone forgot the dummy engine.



Climb out after slow fly-by. This makes it worth all the effort.

Now where's that kid with the chocks and rag to wipe my goggles?

side. Use the right mount rail for alignment. You've now built in the 2° engine down thrust.

When the glue is dry, un-clamp the sides and prepare to build the fuselage box. Pre-cut the cross pieces and landing gear plates. Use your favorite technique to build the frame assembly. I use Kraft rubberband loaded clamps because of the long clamp fingers, the 90° squareness and they won't loosen up. If you're used to building upside down on the top view, have at it. The top longeron is straight and lends itself to this method.

Before joining the sides, I trial fit the radio installation to establish servo rail mount locations. Servos were mounted on a Kraft plate (or radio of your choice). The original model radio was installed through the front and rear cockpits with no problem. If a bottom hatch is your preference, inset them between the landing gear mounting plates and longerons. Building buddy, Bob Brown, used this method and the result was gorgeous. By insetting the hatch, the side view is not marred by a "toy" hatch look. Coupled aileron and rudder is recommended because of slow speed flying and scale control gaps. The July 1980 RCM (page 68) has an article by some obscure author on how to install the linkage.

After the basic frame is built, install the radio and pushrods. Obviously, this installation isn't final, but you'll be able to tie down rod guides, build a battery and receiver compartment without working in closed quarters. At this point, turn the radio on and check servo direction response with respect to control horn location. If your

radio has servo reversing switches there isn't any problem. If you can't reverse servos, save yourself potential embarrassment and pre-check it.

A point to remember. The O.S. .60 4-cycle throttle linkage is on the **left** side of the engine. If you plan to try more than one engine, provide throttle servo mounts on both the left and right hand sides of the fuselage. A big S-bend in the throttle control rod (or cable) is asking for trouble.

Bend the landing gear struts and cut the axle. I glue the wire together with CA glue before wire wrapping, so that tracking may be checked prior to silver soldering. The gear is clamped to the 1/4" ply mounting plates with nylon l.g. clamps. Most brands have 1/2" screw hole centers which is important because the wing strut attach plates are mounted with the same hardware, between the fuselage bottom and 1/8" wire l.g. struts. I avoid sheet metal screws in high load areas. Williams Bros. 6⅝" vintage wheels (p/n 675) were used and installed per their instructions. I trial installed a tail wheel, clamped it straight, and ran a tracking test. With the unsoldered gear installed, I roll the fuselage/gear assembly across 10 feet of smooth garage floor. The assembly should track straight. If it veers left or right, I rotate the wire wrapped joints and reglue with CA. After tracking is straight, the wheels are removed, and the gear silver soldered. Pre-cut the turtledeck 1/8" x 1/4" stringers (long) and save the cut-off for tail ribs. Put the fuselage frame/gear assembly aside and build the wing.

Wing and Struts:

The wing is straightforward construction. However, a bit of pre-planning is necessary:

(1) Place your aileron servo on the plan, plug it into the receiver and note output direction for left and right aileron. Place the bellcranks on the plan and as the aileron servo is activated, make sure the left aileron will raise for left turn and the right aileron will lower. Repeat for right turn (right aileron raises, left lowers) and mark bellcrank orientation on the plan. This may sound basic, but reversed ailerons are not too slick, and ailerons that raise together are called "crash" linkage.

(2) The 1/4" dihedral eliminates the drooped look of flat wings and the wing looks flat.

(3) The wing tips are cut from blocks to the mean camber contour. Straight tips will give you a washed-in tip plate that not only looks terrible, but produces interesting tip stall characteristics.

(4) Cut all long pieces of sheet and strip first. Shorter pieces are used for planking and tail rib caps.

(5) The rib capstrips should be 1/16" x 1/8" for scale size, but 1/16" x 1/4" may be easier to work with.

(6) Many builders build sandwich style, i.e., bottom planking, capstrips, spars, ribs, spars, top planking and strips. I prefer to build a basic unplanked / unstripped frame and check all internal glue joints before they're hidden. 1/16" scrap will raise ribs and spars off the plan for proper positioning.

(7) **Do not** install the wing strut 4-40 T-nuts until the trial assembly.

(8) Aileron gap is 1/8". Closed gaps make little difference because of the slow flying speed.

(9) Aileron differential made no difference because of the slow flying speed.

(10) Large Klett hinges were used for all control surfaces. This allows full length 1/32" wire hinge pins which are removable. This really simplifies covering and clean-up.

The struts are made per plan. If contouring the strut bothers you, invest in a razor plane and shaping will take about ten minutes per strut. Streamline tubing is available but I'd insert a dowel in it. Remember: The struts are functional.

Tail Group:

The tail group is a basic 1/4" thick frame, capped top and bottom with 1/16" strips and gussets. Almost all joints are overlapped so watch wood weight. The original model tail group (uncovered) weighed 3 ounces. Again, use large Klett hinges and full length hinge pins.

Fuselage Completion:

The fuselage frame is now ready for the finishing touches. If your radio is still installed from the trial installation, remove it. Dust is not good for servos and receiver plugs. Complete the fuselage in the following steps:

(1) Cut engine mount plate to suit the size of your engine. The O.S. .60 4-cycle is shown on the plans. Drill the mount screw holes in the mount and rails at the same time. Open rail holes for 4-40 T-nuts.

(2) With CA, glue top forward formers and oil wall. The oil wall top should have tank opening in it before installation.

(3) With CA, glue tank floor, doghouse back and cover. Trial fit tank.

(4) With CA, glue 1/32" ply side plates and bottom. Remember to transfer cabane mount holes and landing gear clamp mounting holes before you glue on the ply.

(5) With CA, glue cockpit covers. Sand plywood joints now.

(6) Glue the lower cowl pieces.

(7) Build the top cowl on the fuselage. Waxpaper and CA make the job go quickly and insure tight mounting face joints.

(8) Glue (with CA) the turtledeck formers and stringers. Remember to scallop the formers between the stringers before gluing in front balsa former.

(9) Glue on the side stringer and taper after mounting.

(10) Glue on the 1/16" x 1/4" covering strips along the longeron sides. These prevent the covering from sticking to uprights and planking between the stringer and longerons. Use 1/32" x 1/4" to transition 1/32" ply and longeron.

(11) Sand the covering strips so that they are feathered to the longeron corners and angled to the stringer. Feather the strips to the cowl and cockpit covers. Glue and sand the 1/4" t.e. stock cabane bolt covering supports.

(12) I closed the cockpits using light-ply covers held on the rear corners with 4-40 screws and T-nuts. If you plan to line the cockpit edges with tubing, allow for the reduced cover size.

Assembly and Covering:

A complete assembly of the model prior to covering is required to locate the strut attach holes in the wings, locating pins in the stab and fin, and to double check that you're not covering before you've finished building.

The wing rods are 3/16" brass tubing, 22" long. To strengthen the tube, I inserted 5/32" dia. x 2" piano wire inside the tube at the wing section joints. To keep the wire in place, I used 1/8" x 1/8" balsa spacers between the wires and tube ends. The balsa is glued in place with CA. This provides a solid rod across the joint without paying a high weight penalty.

Assembly Before Covering:

(1) Install the cabanes in the fuselage. About now you're glad you identified them left, right, forward and aft. Install landing gear and strut mounts.

(2) Install the wing center section on the cabanes. A socket head ball driver is used to tighten the screws. I used shrink tubing on the end of the driver and shrunk it around the head of the screw. This holds the screw in place during installation and removal.

(3) Slide the outer wing panels on and lay the model upside down on your bench or floor. Place a piece of 1/4" thick balsa at the rib high point of the center section to relax the wing in its natural dihedral position. Install the struts on the fuselage and check the aluminum strut mount and strut end plate bend angles for full mounting surface contact. Mark the strut mount fore and aft centerlines on the wing

panels. Line up the strut wing mount holes on the centerlines and mark the holes. Drill out the holes for 4-40 T-nuts and glue (with CA) the nuts in the wing. Install the 4-40 strut mounting screws and put the model right-side up on the landing gear. You should be able to lift the assembly by the wing tips with the wing remaining rigid.

(4) Remove the struts and outer wing panels and check out the rubberband joiners. Make a long hook out of 1/16" piano wire that will pass through the center section with 4" to spare. Wrap the other end around a 1/2" dowel, so you have something to pull with. Cut four 1/4" dowels, 3" long and make a 1" thick block out of wood. Install the bands first as follows:

a. Slide the hook through the forward band hole. Slip four #64 bands over the hook and insert a 1/4" dowel through the bands. As you pull the bands through the center section, the dowel will hold them as one end. As the bands come through, slip a dowel in front of the hook between the bands. Relax the hook and the dowel will prevent them from going back through the center section. Slip the hook off and repeat for the aft band hole.

(5) Slip the l.e. and t.e. 1/16" wire guides in the center section and slide an outer wing panel on. Slip the 1" block between the outer panel and center section at chord midpoint. Slip the bands over the forward band hook in the outer panel with the 1/4" dowel. Pull out the dowel. The wing joint is now in tension and will hold the 1" block in place. Repeat for the aft hook. Push the 1" gap open with your fingers and the block will drop out. Carefully close the gap making sure the wing is sliding on the support rods and fore/aft pins. At this point, I pull my fingers out and the wing snaps flush with the center section. Repeat the process for the other wing panel. This system makes an extremely strong joiner which you need because, if a wing panel moves away from the center section during flight, the aileron will move with it.

To remove the wings, cut the bands with an X-Acto knife and slip the wings off. Never use bands on any model for more than one flying session.

(6) Locate the stab on the fuselage. Hold with masking tape and drill two 1/16" holes through the stab into the stab mount plate and longeron rear joint. Drill the holes on the center line of the stab, which is also the center line of the fin. Transfer the holes to the fin. Glue two toothpicks in the stab, extending 1/8" above and below the stab. Now, the stab and fin have locating pins and holes which makes final assembly very easy.

(7) At this point, you probably forgot to put an inside antenna tube in the fuselage. Nothing looks tackier than a well-built model with a wire tied to the fin or trailing. Put a tube in that exits in front of the tail wheel.

Covering:

Before any covering takes place, a minor amount of fuel-proofing must be done. I've already mentioned the fuel tank "doghouse," now let's include the inside of the cowl and the engine mounting plate. K & B resin was used on the original with very satisfactory results. Put the drainage tube in the lower cowl compartment --- fires are something that no one needs. Conventional .60's may need a muffler exhaust extension. I have found, without exception, that mufflers and extensions don't come with hi-temp gaskets. "Perfect" makes the material and it's easy to make your own. By using gaskets, the oily exhaust doesn't leak through engine exhaust system ioints and the inside of the cowl stavs very clean. Without the gaskets, you've got the "La Brea Tar Pits."

The original model was covered with MonoKote. Not scale you say? Homebuilts don't shine? Wrong, nitrate dope breath. I've seen photos of actual "Pete's" that had mirror finishes. If you model an existing Air-Camper and the finish is matte and fabric texture, use FabriKote. I modeled mine after one I'd like to see full size; finished in 12 coats of hand rubbed "Berryloid Dope."

The Williams Bros. wheels are molded in white plastic and you might want to paint them to compliment your color scheme. "Formula U" works fine. To mask the tire off, cut a circle in heavy card stock that's 1/8" smaller than the hub diameter. Make sure the stock is big enough to cover the wheel diameter. Slit the stock and slip it between the wheel and the hub. You'll end up with a shallow cone with the slit joint overlapped. Spray away and let dry before removing the mask. Take a razor blade and scrape the paint off the simulated lacing and you've got a very realistic looking wheel.

Strut fairings used to be a real pain to install. Foremost Products came to the rescue with their p/n 113 — 1/8 I.D. plastic fairing material. At first glance, you think you've got to slip it over the wire before bending. Well, try this; slit the front of the fairing material and push it over the wire. The plastic has a good memory, but does need a little help. Hold the slit together with a plastic bag and, using CA, glue the slit closed. It not only seals the slit, but anchors the fairing to the wire. You got it on crooked, right? Rotate the strut and re-glue. Glue ran on the strut? Take the razor blade and flat scrape the plastic. You end up with a consistent matte finish. Several manufacturers make cockpit edging (Foremost and Proctor), but I tried a different approach, mainly because I had the material on hand. Electronic stores sell chassis molding which is U-shaped rubber with various width slots. I used molding with a 1/32" slot, which is a perfect fit for the 1/32" ply. For the cockpit sides and back, I cut off one leg of the U (which makes an L) and glued it down with CA.

Striping adds detail and I striped to my heart's content. I set the model in the sun for 8 hours to set the adhesive (or get sun-stroke). After the first flying session, the striping was coming loose. Enough of this jazz. I re-striped the model and, using CA with a small tube and gravity for-feed, I nailed down the striping. It hasn't moved since. Identification numbers on wings are easy with tissue. I'm the first to admit that MonoKote letters are not my strong suit. The local office supply shop came to the rescue. They carried vinyl house numbers and letters 6" high. They haven't moved since installation either.

A dummy model "A" engine looks good and dresses up the front end. I'll have to admit I hate to cover a gorgeous 4-cycle, because the engine looks realistic when running, but mainly it's almost impossible to install the exhaust stack through the dummy engine. A slot is required which is pretty well-hidden. I tried making a straight exhaust, but, alas, the tube size is furlongs per fortnight (metric). Maybe the engine manufacturers will make a straight tube accessory (hint!!). If you've got some old VG-2 Champion glow plugs, they really set it off. If you've got old V-2 Champion spark plugs, all correspondence will be answered.

If you build a dummy engine, build the radiator. I attached mine, with 4-40 flat head screws, to a pine block glued on the forward top fairing. Just tap the block, CA the wooden threads and re-tap.

Flying:

The model flies about 22 mph. It loops very nicely after a slight dive. Stall turns are crisp. Touch and go's are crowd pleasing. I'm not bragging, just paying a compliment to Joe Zdankiewicz who was generous enough to make the maiden flight and the majority of all other flights. The point I'm making is: If you've taken your best shot at building a model but are a little shaky about flying it, don't be bashful, get experienced help. Several "Pete's" have been built and performance has been very similar. John Camp does a very respectable

roll with his (O.S. .60 4-cycle powered). Dave Brodsky made a hard landing and broke his cabanes. Very simple to fix unless you glued them in. (I won't mention names.)

Conclusion (at last!!):

I mentioned several manufacturer's products by name simply because their product is what I used. If you choose to build the "Air-Camper," I'd welcome pictures, comments or different ideas. "Not Invented Here" is a term that is not appropriate in modeling circles. Borrow from anybody --- just give them credit. □

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